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Signed

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MEMORANDUM FOR	Francis Grailand Hall Division Chief, Administrative and Customer Services Division
From:	Ruth Ann Killion Chief, Demographic Statistical Methods Division
Subject:	Survey of Income and Program Participation (SIPP) 2004 Panel: Source and Accuracy Statement for Longitudinal Analysis of Waves 1 to 12 Public Use Files (S&A-10)[1]

Attached is the Source and Accuracy Statement for longitudinal analysis of the twelve waves of the 2004 Survey of Income and Program Participation (SIPP).

Attachment

cc:

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[1]This source and accuracy statement can also be accessed through the U.S. Census Bureau website at "*http://www.sipp.census.gov/sipp/source.*html"

SOURCE AND ACCURACY STATEMENT FOR THE SURVEY OF INCOME AND PROGRAM PARTICIPATION (SIPP) 2004 PANEL FOR LONGITUDINAL ANALYSIS OF WAVES 1 TO 12 PUBLIC USE FILES [2]

DATA COLLECTION AND ESTIMATION

Source of Data: The data were collected in the 2004 Panel of the Survey of Income and Program Participation (SIPP). The population represented in the 2004 SIPP (the population universe) is the civilian noninstitutionalized population living in the United States. The institutionalized population, which is excluded from the universe, is composed primarily of the population in correctional institutions and nursing homes (91 percent of the 4.1 million institutionalized people in Census 2000).

The 2004 Panel of the SIPP sample is located in 351 Primary Sampling Units (PSUs), each consisting of a county or a group of contiguous counties. Of these 351 PSUs, 123 are self-representing (SR) and 228 are non-self-representing (NSR). SR PSUs have a probability of selection of one. NSR PSUs have a probability of selection of less than one. Within PSUs, housing units (HUs) were systematically selected from the master address file (MAF) used for the 2000 decennial census. To account for HUs built within each of the sample areas after the 2000 census, a sample containing clusters of four HUs was drawn from permits issued for construction of residential HUs up until shortly before the beginning of the panel. In jurisdictions that don't issue building permits or that have incomplete addresses, we systematically sampled expected clusters of four HUs which were then listed by field personnel.

Sample households within a given panel are divided into four random subsamples of nearly equal size. These subsamples are called rotation groups and one rotation group is interviewed each month. Each household in the sample was scheduled to be interviewed at four-month intervals over a period of roughly four years beginning in February 2004. The reference period for the questions is the four-month period preceding the interview month. The most recent month is designated reference 4, the earliest month is reference month 1. In general, one cycle of four interviews covering the entire sample, using the same questionnaire, is called a wave. Table 1 indicates the reference months corresponding to each interview month for all 12 waves of the 2004 SIPP Panel. For example, Wave 1 rotation group 1 of the 2004 Panel was interviewed in February 2004 and data for the reference months October 2003 through January 2004 were collected.

The period covered by the 12 waves of the SIPP 2004 panel consists of 48 interview months (12 interviews) conducted from February 2004 to January 2008. Data for up to 51 reference months are available for persons on the file. Specific months available depend on the person's rotation

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[2] For questions or further assistance with the information provided in this document contact: Tracy Mattingly of the Demographic Statistical Methods Division on 301-763-6445 or via the email at Tracy.L.Mattingly@census.gov.

group and his/her sample entry or exit date. Also note that the availability of data on household composition begins with the first interview month of a rotation group.

In Wave 1, the SIPP 2004 Panel began with a sample of about 62,700 HUs. About 11,300 of these HUs were found to be vacant, demolished, converted to nonresidential use, or otherwise ineligible for the survey. Field Representatives (FRs) were able to obtain interviews for about 43,700 of the eligible HUs. FRs were unable to interview approximately 7,700 eligible HUs in the panel because the occupants: (1) refused to be interviewed; (2) could not be found at home; (3) were temporarily absent; or (4) were otherwise unavailable. Thus, occupants of about 85 percent of all eligible HUs participated in the first interview of the panel.

For subsequent interviews, only original sample people (those in Wave 1 sample households and interviewed in Wave 1) and people living with them were eligible to be interviewed. We followed original sample people if they moved to a new address, unless the new address was more than 100 miles from a SIPP sample area. In this case, FRs attempted telephone interviews. Based on these follow-up criteria, FRs were able to interview about 40,600 HUs of the approximately 44,200 eligible HUs for Wave 2, about 39,100 HUs of the approximately 44,600 eligible HUs for Wave 3, about 38,300 HUs of the approximately 44,900 eligible HUs for Wave 4, about 37,400 HUs of the approximately 45,400 eligible HUs for Wave 5, about 36,900 HUs of the approximately 45,600 eligible HUs for Wave 6, about 36,300 HUs of the approximately 45,700 eligible HUs for Wave 7, and about 36,000 HUs of the approximately 45,700 eligible HUs for Wave 8. In each of these waves, FRs were unable to interview some of the eligible housing units because the occupants either directly or indirectly refused to be interviewed in the same manner described for Wave 1 or moved to an unknown address. The rates of non-interviewed housing units due to direct or indirect refusal (Type A non-interviewed households) were 6.6% for Wave 2, 9.9% for Wave 3, 11.6% for Wave 4, 13.7% for Wave 5, 15.0% for Wave 6, 16.1% for Wave 7, and 16.1% for Wave 8. The rates of non-interviewed HUs due to moving to an unknown address (Type D non-interviewed households) were 1.4% for Wave 2, 2.5% for Wave 3, 3.1% for Wave 4, 3.7% for Wave 5, 4.1% for Wave 6, 4.5% for Wave 7, and 5.2% for Wave 8.

Due to budget constraint, a sample reduction was made at Wave 9 to reduce the sample size by about 50%. The sample reduction is based on reducing/cutting the sample households in each sample PSU using the procedure specified in the memorandum titled *SIPP 2004 Panel Wave 9 Sample Reduction (SAMP-1)*, Demographic Statistical Methods Division (DSMD), July 21, 2006. The sample reduction is applied on the designated sample housing units/living quarters (selected in Wave 1) that are referred to as *sample units*. Therefore, if a sample unit is selected for Wave 9, its original (Wave 1) and spawned households all survive the sample reduction (are all kept in the sample for Wave 9 and beyond). The sample reduction results in reducing the sample size at Wave 9 from approximately 48,900 designated HUs to approximately 22,800 designated HUs (about 53% reduction in sample size). Among these 22,800 designated HUs, approximately 21,300 HUs were eligible for interview at Wave 9. Out of these 21,300 HUs, FRs were able to interview about 16,600 HUs for Wave 9, about 16,200 HUs for Wave 10, about 15,900 for Wave 11, and about 16,000 HUs for Wave 12. Among the non-interviewed HUs, (a) the rates of non-interviewed HUs due to direct or indirect refusal (Type A non-interviewed households) were 16.9% for Wave 9, 18.5% for Wave 10, 19.7% for Wave 11, and 18.9% for Wave 12, and (b) the rates of non-interviewed HUs due to moving to an unknown address (Type D non-interviewed households) were 5.2% for Wave 9, 5.3% for Wave 10, 5.7% for Wave 11, and 6.4% for Wave 12.

As mentioned earlier, the SIPP follows its original sample people (Wave 1 interviewed people). Thus, for the original sample people who have moved to form their new households (HHs), their new households (in new addresses/HUs) are also included in the sample. The sample growth (expansion) among the original (Wave 1) interviewed households accrued up to a given wave (Waves 2 to 12) can be directly determined, but the sample growth among the original non-interviewed eligible households (Wave 1 Type A non-interviewed households) up to a given wave cannot be directly determined (because we did not attempt to interview them after Wave 1). Consequently, the sample growth among the original non-interviewed eligible households is indirectly estimated in the following manner. We first define a growth factor (GF) for a given wave among the original interviewed households as the ratio *of* the number of the eligible sample households (interviewed + Type A non-interviewed + Type D non-interviewed households) at the given wave *to* the number of the original interviewed households. We then assume that the growth factor for a given wave among the original non-interviewed eligible households is the same as the growth factor for the same given wave among the original interviewed households. Based on this assumption, the sample loss for a current (given) wave <u>before</u> the sample reduction (Wave 2 to 8) can be expressed as shown in the equation below.

$$\textit{Sample Loss before Sample Reduction} = \frac{A_1 \times GF_C + A_C + D_C}{I_C + A_1 \times GF_C + A_C + D_C}$$

where A_1 is the number of Wave 1 Type A non-interviewed households, GF_C is the growth factor for the current wave, A_C is the number of current wave Type A non-interviewed households, D_C is the number of current wave Type D non-interviewed households, and I_C is the number of current wave interviewed households. Similarly, the sample loss for a current wave <u>after</u> the sample reduction (Wave 9 to 12) can be expressed as shown in the equation below.

$$\textit{Sample Loss after Sample Reduction} = \frac{A_1 \times GF_C \times 0.47 + A_C + D_C}{I_C + A_1 \times GF_C \times 0.47 + A_C + D_C}$$

where the factor 0.47 accounts for 53% reduction in sample size at Wave 9; namely, 1 - 0.53 = 0.47.

Based on the above two equations, the sample loss at each wave of the SIPP 2004 Panel was calculated and tabulated as shown in the table below.

Sample Loss for the SIPP 2004 Panel								
Wave	Eligible	Interviewed HHs	Type A Non-interviewed HHs		Type D Non-interviewed HHs		Growth Factor	Sample Loss
			Total	Rate	Total	Rate		
1	51,363	43,711	7,652	14.9%	N/A	N/A	N/A	14.9%
2	44,150	40,587	2,935	6.6%	628	1.4%	1.0227	21.9%
3	44,614	39,117	4,395	9.9%	1,102	2.5%	1.0356	25.5%
4	44,930	38,309	5,208	11.6%	1,413	3.1%	1.0427	27.6%
5	45,350	37,446	6,229	13.7%	1,675	3.7%	1.0490	29.8%
6	45,638	36,931	6,830	15.0%	1,877	4.1%	1.0540	31.2%
7	45,688	36,289	7,342	16.1%	2,057	4.5%	1.0571	32.5%
8	45,684	35,966	7,358	16.1%	2,360	5.2%	1.0599	33.1%
9	21,296	16,587	3,608	16.9%	1,101	5.2%	1.0619	34.0%
10	21,342	16,235	3,919	18.5%	1,188	5.3%	1.0636	35.5%
11	21,347	15,894	4,173	19.7%	1,280	5.7%	1.0653	36.9%
12	21,332	15,952	4,024	18.9%	1,356	6.4%	1.0668	36.6%
Note: The sample loss in Wave 1 is the same as the Type A non-interviewed household rate because sample growth and Type D non-interviewed households do not exist in Wave 1.								

The current release of this document is final and supersedes all its preceding releases. Namely, this release covers the 2004 calendar year (CY1), 2005 calendar year (CY2), 2006 calendar year (CY3), 2007 calendar year (CY4), first 4-wave panel (PNL1), first 7-wave panel (PNL2), first 10-wave panel weights (PNL3), and full 12-wave panel weights (PNL4). The sample reduction does not affect the CY1, CY2, first 4-wave panel, and first 7-wave weighting because it involves only up to the first seven waves of the 12-waves of the entire panel. For the 2006 calendar year (CY3), 2007 calendar year (CY4), first 10-wave panel (PNL3), and full 12-wave panel (PNL4) weights, the effect of the sample reduction is accounted for in their weighting based on the sample reduction factor for each sample PSU derived from the sample reduction procedure discussed earlier.

For the panel (PNL1, PNL2, PNL4, and PNL3) and calendar year (CY1, CY2, CY3, and CY4) weighting procedures, a person was classified as interviewed or non-interviewed based on the following definitions. (NOTE: A person may be classified differently for calculating different weights.) Interviewed sample persons (including children) were defined to be:

1) those for whom self, proxy, or imputed responses were obtained for each month of the appropriate longitudinal period, or

2) those for whom self or proxy responses were obtained for the *first month of the appropriate longitudinal period* and self, proxy, or imputed responses exist for each subsequent month until they were known to have died or moved to an ineligible address (foreign HUs, institutions, or military barracks).

The months for which persons were deceased or residing in an ineligible address were identified on the file. Non-interviewed persons were defined to be those for whom neither self nor proxy responses were obtained for one or more months of the *appropriate longitudinal period* (excluding imputed persons and persons who died or moved to an ineligible address).

It is estimated that roughly *161,100*[3] people were initially designated in the sample[4]. Approximately *112,300* people were interviewed in Wave 1; however, we did not interview approximately *19,700* of the sample persons in the panel because the occupants, (1) refused to be interviewed, (2) could not be found at home, (3) were temporarily absent, or (4) were otherwise unavailable. Thus, about 70 percent of all people initially designated in the sample participated in the first interview of the panel.

Calendar weighting before the sample reduction: For CY1 weighting, the eligible sample cohort includes only people classified as *interviewed* in January 2004 as indicated in Table 1 (Tables 1 to 4 are located at the end of this document), and they are by definition all original (Wave 1) sample people. The time span covered for the CY1 weighting is from January 2004 through December 2004. For CY2 weighting, the eligible sample cohort includes only people classified as *interviewed* in January 2005, and they are by definition composed of original sample people and those joining the sample households at later times during Wave 2 to Wave 4 as indicated in Table 1. The time span covered for the CY2 weighting is from January 2005 through December 2005.

Calendar year weighting after the sample reduction: For the CY3 weighting, the eligible sample cohort includes only people classified as *interviewed* in January 2006 provided their sample households in January 2006 originated or were spawned from a sample unit that survived the sample reduction at Wave 9. By definition, these sample people are composed of original sample

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[3]All values given in italics in this paragraph are estimates.

[4]This approximation represents the number of HUs fielded in Wave1 multiplied by the average number of persons per household in Wave 1.

people and those joining the sample households at later times during Wave 2 to Wave 7 as indicated in Table 1 (provided their sample household in January 2006 originated from a sample unit that survived the sample reduction at Wave 9). The time span covered for the CY3 weighting is from January 2006 through December 2006. For the CY4 weighting, the eligible sample cohort considered includes only all people classified as *interviewed* in January 2007. Since January 2007 is in Wave 10 as indicated in Table 1, this automatically implies that their sample households in January 2007 must be originated or spawned from a sample unit that survives the sample reduction at Wave 9. Therefore, they are composed of original sample people and those joining the sample households at later times during Wave 2 to Wave 10, and their households in January 2007 originated or were spawned from a sample unit that survived the sample reduction at Wave 9. The time span covered for the CY4 weighting is from January 2007 through last reference month (Reference Month 4) of Wave 12 for each of the four rotations of the sample. Namely, the time span covered for the CY4 weighting is from January 2007 to September 2007 for Rotation 1, January 2007 to October 2007 for Rotation 2, January 2007 to November 2007 for Rotation 3, and January 2007 to December 2007 for Rotation 4, as indicated in Table 1.

The CY1 weighting classified about 87,600 people as interviewed and had a person nonresponse rate of 20.3%. The CY2 weighting classified about 78,200 people as interviewed and had a person nonresponse rate of 19.9%. The CY3 weighting classified about 35,000 people as interviewed and had a person nonresponse rate of 19.3% (a 53% sample cut occurred at Wave 9). The CY4 weighting classified about 34,900 people as interviewed and had a person nonresponse rate of 16.0%. Note that the person nonresponse rate for the CY4 weight (16.0%) is noticeably less than the one for CY3 (19.3%). This is deemed attributable to the fact that the number of interview waves available for classifying the CY3 longitudinal interview statuses is four waves (Waves 7 through 10) but the number of interview waves available for classifying the CY4 longitudinal interview statuses classification is only three waves (Waves 10 through 12) because the SIPP 2004 Panel ended at Wave 12, as indicated in Table 1. Namely, higher number of interview waves used for classifying longitudinal interview statuses of a cohort of sample people generally results in higher longitudinal non-interview/nonresponse rate among the cohort.

Wave-panel weighting before the sample reduction: For the PNL1 and PNL2 weighting, the eligible sample cohorts include only people classified as *interviewed* in January 2004 as indicated in Table 1, and they are by definition all original (Wave 1) sample people. The time span covered for the PNL1 weighting is from Wave 1 through Wave 4 (the first 16 reference months), the time span covered for the PNL2 weighting is from Wave 1 through Wave 7 (the first 28 reference months).

Wave-panel weighting after the sample reduction: For the PNL3 and PNL4 weighting, the eligible sample cohorts considered includes only all people classified as *interviewed* in January 2004 provided their sample households in January 2004 originated or were spawned from a sample unit that survived the sample reduction at Wave 9. By definition, these two cohorts are all original (Wave 1) sample people whose households in January 2004 originated or were spawned from a sample unit that survived the sample reduction at Wave 9. The time span covered for the PNL3 weighting is from Wave 1 through Wave 10 (the first 40 reference months), and the time span covered for the PNL4 weighting is from Wave 1 through Wave 12 (all 48 reference months).

The PNL1 weighting classified about 86,050 people as interviewed and had a person nonresponse rate of 20.2%. The PNL2 weighting classified about 72,100 people as interviewed and had a person nonresponse rate of 34.2%. The PNL3 weighting classified about 29,500 people as interviewed and had a person nonresponse rate of 42.9% (a 53% sample cut occurred at Wave 9). The PNL4 weighting classified about 27,300 people as interviewed and had a person nonresponse rate of 47.0%.

Estimation: The SIPP program produces weights for both cross-sectional and longitudinal analysis. What follows is an overview of the longitudinal estimation.

All people classified as interviewed for the longitudinal period of a longitudinal weight (i.e., PNL1 to PNL4, and CY1 to CY4) are assigned positive weights for that period, while those classified as non-interviewed or excluded from the weighting process are assigned zero weights. Longitudinal weights are produced at the completion of Waves 4, 7, 10, and 12 (last wave).

To advantageously utilize the effective sample sizes (number of sample people with positive weights) of the longitudinal panel weights PNL1 to PNL4 for panel estimates, we make the following recommendation for panel estimates using the longitudinal panel weights PNL1 to PNL4:

- Use the longitudinal panel weight PNL1 for panel estimates involving time spans within or up to the first four waves (Waves 1 to 4) because the effective sample size of PNL1 is larger than those of PNL2, PNL3, and PNL4. (Particularly, due to the sample reduction at Wave 9, the effective sample sizes of PNL1 and PNL2 are much larger than those of PNL3 and PNL4.)
- Use the longitudinal panel weight PNL2 for panel estimates involving time spans longer than or outside the first four waves but within or up to the first seven waves (waves 1 to 7) because the effective sample size of PNL2 is larger than those of PNL3 and PNL4.
- Use the longitudinal panel weight PNL3 for estimates involving time spans longer than or outside the first seven waves but within or up to the first 10 waves (waves 1 to 10) because the effective sample size of PNL3 is larger than that of PNL4.
- Use the longitudinal panel weight PNL4 for estimates involving time spans longer than or outside the first 10 waves but within or up to the 12 waves (full panel).

For the CY1, PNL1, and PNL2 weights, we consider only the sample people who are classified as interviewed in January 2004 (Wave 1) in our weighting process. We assign the initial weight (*InitWt*) of each of the sample people equal to his/her cross-sectional household non-interview adjusted weight for January 2004 (*XHNIAW_Jan04*), namely,

$$InitWt = XHNIAW\_Jan04 = BW \times DCF \times NIAF\_W1,$$

where BW denotes the base weight which is the inverse of the probability of selection of his/her household in Wave 1, DCF denotes the Duplication Control Factor to adjust for subsampling done in the field in Wave 1 when the number of housing units in a sample housing unit cluster is much larger than expected, and NIAF_W1 denotes his/her household non-interview adjustment factor to account for eligible sample households that could not be interviewed in Wave 1 (January 2004 is in Wave 1). Note that the cross-sectional household non-interview adjusted weight is the same for all its four reference months only for Wave 1. The weight XHNIAW_Jan04 is produced in the cross-sectional weighting process.

For the CY2 weight, we consider only the sample people who are classified as interviewed in January 2005 (Wave 4) in our weighting process. We assign the initial weight *InitWt* of each of these sample people equal to his/her cross-sectional household non-interview adjusted weight for January 2005 (*XHNIAW_Jan05*), namely,

$$InitWt = XHNIAW\_Jan05.$$

As indicated in Table 1, January 2005 is Wave 4. Unlike Wave 1, for a given wave among Waves 2 and beyond, the cross-sectional household non-interview adjusted weights of its four reference months are generally not the same because a household composition could change from month to month. A household composition change is due to adding or losing its household members or merging with other households. The weight XHNIAW_Jan05 is produced in the cross-sectional weighting process.

For the CY3 weight, we consider in our weighting process only the sample people who are classified as interviewed in January 2006 (Wave 7) and whose households in January 2006 originated or were spawned from a sample unit that survived the sample reduction in Wave 9. We assign the initial weight *InitWt* to each of these sample people as expressed in the equation below.

$$InitWt = XHNIAW\_Jan06 \times SCFCT,$$

where XHIAW_Jan06 denotes his/her cross-sectional household non-interview adjusted weight for January 2006, and SCFCT denotes the sample reduction/cut factor accounting for effect of the sample reduction at Wave 9. The weight XHNIAW_Jan06 and the sample reduction/cut factor SCFCT are produced in the cross-sectional weighting process.

For the CY4 weight, we consider, in our weighting process, only the sample people who are classified as interviewed in January 2007 (Wave 10). To be an interviewed sample person in Wave 10 automatically implies that his/her sample household either survived the sample reduction at Wave 9 or is just spawned in Wave 10 from a sample household that survived the sample reduction at Wave 9. This implies that his/her cross-sectional household non-interview adjusted weight for January 2007 has already accounted for the effect of sample reduction at

Wave 9. Therefore, we simply assign his/her cross-sectional household non-interview adjusted weight for January 2007 (*XHNIAW_Jan05*) as his/her initial weight *InitWt*, namely,

$$InitWt\ = XHNIAW\_Jan07.$$

The weight XHNIAW_Jan07 is produced in the cross-sectional weighting process.

For the PNL3 and PNL4 weights, we consider in our weighting process only the sample people who are classified as interviewed in January 2004 (Wave 1) and whose households in January 2004 originated or were spawned from a sample unit that survived the sample reduction in Wave 9. We assign the initial weight *InitWt* to each of these sample people as expressed in the equation below.

$$InitWt\ = XHNIAW\_W1 \times SCFCT,$$

where XHIAW_W1 denotes his/her cross-sectional household non-interview adjusted weight for January 2004, and SCFCT denotes the sample reduction/cut factor accounting for the effect of the sample reduction at Wave 9. The weight XHNIAW_W1 and the sample reduction/cut factor SCFCT are produced in the cross-sectional weighting process.

Next we applied a person level longitudinal non-interview adjustment factor (F_{NI}) to account for eligible sample people who are classified as *longitudinally non-interviewed* for a longitudinal weight under consideration. They are sample people (including children) who are interviewed for the first month but are not interviewed for one or more subsequent months of the reference period of a longitudinal weight under consideration due to refusal to interview, relocation to an unknown address, or other reasons (excluding death and moving to live in Armed Forces barracks, institution, and foreign country). The factors were calculated individually for sample persons in each of 149 non-interview adjustment cells.

The last adjustment is the second-stage (post stratification) adjustment factor, (F_{2S}). This incorporates an iterative process to adjust estimates for selected demographic groups to match their population controls (independent benchmark estimates). The second-stage adjustment results in the final weight that is traditionally corrected for the survey undercoverage and thereby reduces the standard error (variance) of the estimates. The population control month for the CY1, PNL1, PNL2, PNL3, and PNL4 weights is January 2004, and the population control months for the CY2, CY3, and CY4 weights are January 2005, January 2006, and January 2007, respectively.

Based on the above discussion, the final longitudinal weight (FW_L) for each of the PNL1 to PNL4 and CY1 to CY4 weight is then expressed as shown in the equation below.

$$FW_L = InitWt \times F_{NI,} \times F_{2S}$$

Population Controls: The survey's estimation procedure adjusts weighted sample results to agree with independently derived population estimates of the civilian noninstitutional population. This attempts to correct for undercoverage and thereby reduces the mean square error of the estimates. The national and state level population controls are obtained directly from the Population Division and are prepared each month to agree with the most current set of population estimates released by the Census Bureau's population estimates and projections program.

The national level controls are distributed by demographic characteristics as follows:

- Age, Sex, and Race (White Alone, Black Alone, and all other groups combined)
- Age, Sex, and Hispanic Origin

The state level controls are distributed by demographic characteristics as follows:

- State by Age and Sex
- State by Hispanic origin
- State by Race (Black Alone, all other groups combined)

The estimates begin with the latest decennial census as the base and incorporate the latest available information on births and deaths along with the latest estimates of net international migration.

The net international migration component in the population estimates includes a combination of:

- legal migration to the U.S.,
- emigration of foreign born and native people from the U.S.,
- net movement between the U.S. and Puerto Rico,
- estimates of temporary migration, and
- estimates of net residual foreign-born population, which include unauthorized migration.

Because the latest available information on these components lags the survey date, to develop the estimate for the survey date, it is necessary to make short-term projections of these components.

Use of Person Weights: *Panel weights* (e.g., PNL1 weights) are computed for sample people who are in sample at Wave 1 and whose monthly data are obtained (either reported or imputed) continuously for every month until they become a survey universe leaver during the longitudinal reference period under consideration. *Calendar year weights* (e.g., CY1 weights) are computed for sample people who are interviewed (self, proxy, or imputed) in January (control month) and whose monthly data are obtained (either reported or imputed) continuously for every month until they become a survey universe leaver during the longitudinal reference period under consideration. The panel weight can be used to form monthly, quarterly, annual, or multi-year estimates (e.g., the PNL3 weights can be used for estimates at any time spans contained in the period between 2004 through 2006). The calendar year weight can be used to form monthly, quarterly, or annual estimates within a specific calendar year.

> **Example**, using the PNL4 panel weight, one can estimate the number of people receiving TANF from January 2004 up to September 2007 using the data from all four rotations of the sample (as indicated in Table 1). Note that if one desires to estimate the total number of people receiving TANF from January 2004 up to December 2007 using the data from all four rotations, proper adjustment (e.g., imputation, extrapolation, etc.) must be done to account for the October, November, and December 2007 censored data due to panel ending of Rotations 2, 3, and 4 (as indicated in Table 1). Another example, using the CY3 weight, one can estimate the number of people receiving TANF for the third quarter of 2006.

Users should be forewarned to apply the appropriate weights given on weighting files before attempting to calculate estimates. The weights vary with demographic and time units of analysis (person, family, and household, monthly in 2004, quarterly in 2004, annually between 2004 to 2006, etc.) due to differences in control months, longitudinal reference periods, interview-refusal and unlocated-mover nonresponses, sample reduction effects if there is sample reduction, etc. that are factored in the weighting adjustments. If an analysis/estimate is done for a cohort of people or families or households (in the survey universe) without applying the appropriate weights, the results will be erroneous.

All estimates may be divided into two broad categories: longitudinal and cross-sectional. Longitudinal estimates require that data records for each person be linked across interviews, whereas cross-sectional estimates do not. For example, annual income estimates obtained by summing the 12 monthly income amounts for each person would require linking records and so would be longitudinal estimates. Because there is no linkage between interviews, cross-sectional estimates can combine data from different interviews only at the aggregate level. Longitudinal person weights were developed for longitudinal estimation, but may be used for cross-sectional estimation as well. However, note that wave files with cross-sectional weights are also produced for the SIPP. Because of the larger sample size with positive weights available on the wave files, it is recommended that these files be used for cross-sectional estimation, if possible.

In this section, it is assumed that all four rotation groups are used for estimation.

Some basic types of longitudinal and cross-sectional estimates which can be constructed using longitudinal person weights are described below in terms of estimated numbers. Of course, more complex estimates, such as percentages, averages, ratios, etc., can be constructed from the estimated numbers. Longitudinal person weights can be used to construct the following types of longitudinal estimates:

1. The number of people who have ever experienced a characteristic during a given time period.

   To construct such an estimate, use the longitudinal person weight for the shortest time period which covers the entire time period of interest. Then sum the weights over all people who possessed the characteristic of interest at some point during the time period of interest. For example, to estimate the number of people who ever received food stamps during the last six months of 2004, use the CY1 weights, since CY1 weights cover all 12 months of 2004. The same estimate could be generated using the panel weights, but there may be fewer positively weighted people than those in the calendar year.

2. The amount of a characteristic accumulated by people during a given time period.

   To construct such an estimate, use the longitudinal person weight for the shortest time period which covers the entire time period of interest. Then compute the product of the weight times the amount of the characteristic and sum this product over all appropriate people. For example, to estimate the aggregate 2004 annual income of people who were employed during all 12 months of the year, use the CY1 weights. The same estimate could be generated using the panel weights (but there may be fewer positively weighted people than those in the calendar year).

3. The average number of consecutive months of possession of a characteristic (i.e., the average spell length for a characteristic) during a given time period.

   For example, one could estimate the average length of each spell of receiving food stamps during 2004. Also, one could estimate the average spell of unemployment that elapsed before a person found a new job. To construct such an estimate, first identify the people who possessed the characteristic at some point during the time period of interest. Then create two sums of these persons' appropriate longitudinal weights: (1) sum the product of the weight times the number of months the spell lasted and (2) sum the weights only. Now, the estimated average spell length in months is given by (1) divided by (2). A person who experienced two spells during the time period of interest would be treated as two people and appear twice in sums (1) and (2). An alternate method of calculating the average can be found in the section "Standard Error of a Mean or Aggregate."

4. The number of month-to-month changes in the status of a characteristic (i.e., number of transitions) summed over every set of two consecutive months during the time period of interest.

   To construct such an estimate, sum the appropriate longitudinal person weight each time a change is reported between two consecutive months during the time period of interest. For example, to estimate the number of people who changed from receiving food stamps in July 2004 to not receiving in August 2004, add together the CY1 weights of each person who had such a change. To estimate the number of changes in monthly salary income during the third quarter of 2004, sum together the estimate of number of people who made a change between July and August, between August and September, and between September and October.

Note that spell and transition estimates should be used with caution because of the biases that are associated with them. Sample people tend to report the same status of a characteristic for all four months of a reference period. This tendency results in a bias toward reported spell lengths that are multiples of four months. This tendency also affects transition estimates in that, for many characteristics, the number of characteristics, the number of month-to-month transitions reported between the last month of one reference period and the first month of the next reference period are much greater than the number of reported transitions between any two months within a reference period. Additionally, spells extending before or after the time period of interest are cut off (censored) at the boundaries of the time period. If they are used in estimating average spell length, a downward bias will result.

Also using longitudinal person weights one can construct the following type of cross-sectional estimate:

5. Monthly estimates of a characteristic averaged over a number of consecutive months.

For example, one could estimate the monthly average number of food stamp recipients over the months July through December 2004. To construct such an estimate, first form an estimate for each month in the time period of interest. Use the longitudinal person weight, summing over all people who possessed the characteristic of interest during the month of interest. Then sum the monthly estimates and divide by the number of months. Either the CY1 weight or the panel weights can be used for this calculation (but there may be fewer positively weighted people than those in the calendar year).

Adjusting Estimates Which use Less than the Full Sample: When estimates involving months with less than four rotations worth of data are constructed from a wave-panel file or files, factors greater than 1 must be applied. However, when core data from consecutive waves are used together, data from all four rotations may be available, in which case the factors are equal to 1. Note that all wave-panel files contain only core data. In a full panel longitudinal analysis using all wave-panel files, the data for the first and last three reference months are not available for all four rotations due to staggered starting and ending months among the four rotations (as indicated in Table 1).

Among the 12 wave-panel files of the SIPP 2004 Panel, all four rotation groups of data are not available for reference months October 2003 through December 2003 on the first (Wave 1) wave-panel file and October 2007 through December 2007 on the last (Wave 12) wave-panel file (see Table 1). If the time period of interest for a given estimate (of person or family or household characteristics) includes these months, the estimate may need to be adjusted in some way to account for the missing rotation groups. For Types 1 to 4 longitudinal estimates (defined earlier under the topic *Use of Person Weights*), this adjustment factor also depends on the duration of the time period under consideration. The simplest duration is monthly one; namely, for monthly estimate, this adjustment factor equals four divided by the number of rotation groups contributing data. For example, if the time period of interest for a given estimate is October 2003, then data will be available only from rotation group 1. Therefore, a factor of 4/1 = 4.0000 will be applied. For Type1 to Type 4 estimates with duration other than monthly one (e.g., quarterly, annually, etc.), their adjustment factors (accounting for their missing rotation) can usually be practically and yet adequately derived using the ratio of 4 to the number of missing rotation groups as its adjustment factor (without resorting to complicate approaches such as proper imputation and extrapolation to obtain data for the censored months of the missing rotation groups). For example, to estimate the number of people ever unemployed in the fourth quarter of 2007, since only rotation group 4 has the data for all/full three months in the fourth quarter of 2007 (as indicated in Table 1), the estimate can be taken as the estimate from rotation group 4 multiplied by an adjustment factor of 4/1 = 4. Note that rotation groups 2 to 3 are ignored because this particular estimate needs full three-month data in the fourth quarter of 2007 and rotation group 1 has no data for all three months in the fourth quarter of 2007.

Note that if the given estimate is an average of monthly estimates (Type 5), then the number of rotation groups and the factor used will be determined independently for each month in the average and the adjusted monthly estimates will be averaged together in the usual way. For example, to estimate the average number of people unemployed per month in the fourth quarter of 2007, the October, November, and December data will be multiplied by 4/3, 4/2, and 4/1 respectively before being summed together and divided by three.

ACCURACY OF ESTIMATES

SIPP estimates are based on a sample; they may differ somewhat from the figures that would have been obtained if a complete census had been taken using the same questionnaire, instructions, and enumerators. There are two types of errors possible in an estimate based on a sample survey: sampling and nonsampling. We are able to provide estimates of the magnitude of SIPP sampling error, but this is not true of nonsampling error.

Nonsampling Error: Nonsampling errors can be attributed to many sources:

- inability to obtain information about all cases in the sample
- definitional difficulties
- differences in the interpretation of questions
- inability or unwillingness on the part of the respondents to provide correct information
- errors made in the following: collection such as in recording or coding the data, processing the data, estimating values for missing data

- biases resulting from the differing recall periods caused by the interviewing pattern used and undercoverage.

Quality control and edit procedures were used to reduce errors made by respondents, coders and interviewers. More detailed discussions of the existence and control of nonsampling errors in the SIPP can be found in the *SIPP Quality Profile, 1998 SIPP Working Paper Number 230, issued May 1999*.

Undercoverage in SIPP results from missed HUs and missed persons within sample HUs. It is known that undercoverage varies with age, race, and sex. Generally, undercoverage is larger for males than for females and larger for Blacks than for non-Blacks. Ratio estimation to independent age-race-sex population controls partially corrects for the bias due to survey undercoverage. However, biases exist in the estimates to the extent that persons in missed households or missed persons in interviewed households have characteristics different from those of interviewed persons in the same age-race-sex group.

A common measure of survey coverage is the coverage ratio, the estimated population before post stratification ratio (second stage) adjustment divided by the independent population control. By definition, a coverage ratio less than one implies undercoverage and a coverage ratio larger the one implies overcoverage. Tables A1 through Table A4 below show the 2004 SIPP coverage ratios corresponding to control month January 2004 by age-sex-race for the first four-wave (PNL1), first seven-wave (PNL2), first ten-wave (PNL3), and full twelve-wave (PNL4) panel weights prior to the post stratification ratio adjustment, respectively. As exhibited in Tables A1 through A4, the coverage ratios generally decreased among age groups below 55 but generally increased among age groups above 54 as the wave-panel weight covered more waves (e.g., the PNL1 weight covered the first four waves, the PNL2 covered the first seven waves). These phenomena are mainly attributable to the increase in difference in response rates between these two age groups as the sample/panel got older (aged). Namely, the response rate of the age-above-54 group decreased slower than the response rate of the age-below-55 group as the panel got older. Such increase in difference in response rates between these two age groups caused the current noninterview weight adjustment procedure to transfer more and more initial weights from the noninterviewed people to the interviewed people in the age-above-54 group than to the interviewed people in the age-below-55 group as the panel got older. This happened at least partly because the current noninterview weight adjustment procedure did not explicitly include age as a variable in forming the noninterview weight adjustment cells. Based on past experience, the distributions of coverage ratios in Tables A1 to A4 are typical. The SIPP coverage ratios also generally exhibit coverage variation from control month to control month (e.g., January 2004 is the control month for the CY1 weight, January 2005 is the control month for the CY2 weight) similar to those of the PNL1, PNL2, PNL3, and PNL4 weights described earlier, and other Census Bureau household surveys (e.g., the Current Population Survey) also experienced similar coverage variation with respect to sample/panel growing older. More importantly, we have effectively reduced the undercoverage and overcoverage of our survey population and its various subgroups (such as those exhibited in Tables A1 to A4) by applying the post stratification (second stage) weight adjustment (after the completion of the noninterview weight adjustment) described earlier in this document.

Table A1 - SIPP Coverage Ratios Corresponding to Control Month January 2004 for the First Four-Wave (PNL1) Panel Weights Prior to Post Stratification Ratio (Second Stage) Weight Adjustment by Age, Race and Sex

	White Only		Black Only		Residual	
Age	Male	Female	Male	Female	Male	Female
0-4	0.910	0.900	0.839	0.753	1.205	1.125
5-9	0.927	0.923	0.837	0.780	1.163	1.092
10-14	0.900	0.909	0.830	0.878	1.112	1.069
15-24	0.748	0.758	0.692	0.720	0.902	0.905
25-34	0.784	0.884	0.666	0.788	0.933	0.964
35-44	0.890	0.899	0.802	0.845	1.029	1.016
45-54	0.872	0.926	0.797	0.925	1.034	1.053
55-64	0.918	0.974	0.909	1.004	1.030	1.194
65+	0.995	0.968	0.978	1.159	1.013	1.020

Table A2 - SIPP Coverage Ratios Corresponding to Control Month January 2004 for the First Seven-Wave (PNL2) Panel Weights Prior to Post Stratification Ratio (Second Stage) Weight Adjustment by Age, Race and Sex

	White Only		Black Only		Residual	
Age	Male	Female	Male	Female	Male	Female
0-4	0.849	0.895	0.773	0.718	1.195	1.176
5-9	0.920	0.914	0.766	0.737	1.163	1.163
10-14	0.898	0.897	0.800	0.837	1.115	1.038
15-24	0.701	0.700	0.625	0.682	0.845	0.878
25-34	0.753	0.859	0.615	0.729	0.920	0.967
35-44	0.880	0.893	0.794	0.859	1.038	1.011
45-54	0.889	0.946	0.793	0.951	1.041	1.099
55-64	0.933	1.016	0.931	1.053	1.121	1.254
65+	1.044	1.008	1.074	1.250	1.130	1.045

Table A3 - SIPP Coverage Ratios Corresponding to Control Month January 2004 for the First Ten-Wave (PNL3) Panel Weights Prior to Post Stratification Ratio (Second Stage) Weight Adjustment by Age, Race and Sex

	White Only		Black Only		Residual	
Age	Male	Female	Male	Female	Male	Female
0-4	0.828	0.944	0.746	0.773	1.129	1.111
5-9	0.959	0.887	0.710	0.673	1.060	1.108
10-14	0.881	0.891	0.749	0.831	1.142	1.058
15-24	0.657	0.648	0.543	0.660	0.822	0.958
25-34	0.750	0.857	0.642	0.700	0.788	0.915
35-44	0.886	0.901	0.731	0.811	0.978	1.003
45-54	0.893	0.958	0.835	0.957	1.146	1.094
55-64	0.966	1.061	0.935	1.214	1.165	1.154
65+	1.124	1.073	1.206	1.290	1.132	1.139

Table A4 - SIPP Coverage Ratios Corresponding to Control Month January 2004 for the Full Twelve-Wave (PNL4) Panel Weights Prior to Post Stratification Ratio (Second Stage) Weight Adjustment by Age, Race and Sex

	White Only		Black Only		Residual	
Age	**Male**	**Female**	**Male**	**Female**	**Male**	**Female**
0-4	0.832	0.936	0.703	0.722	1.075	1.132
5-9	0.960	0.885	0.676	0.628	1.043	1.116
10-14	0.876	0.879	0.704	0.740	1.120	1.115
15-24	0.641	0.619	0.519	0.637	0.783	0.914
25-34	0.742	0.843	0.612	0.689	0.811	0.870
35-44	0.882	0.889	0.721	0.795	0.934	1.025
45-54	0.894	0.965	0.874	0.975	1.180	1.111
55-64	0.986	1.080	0.994	1.260	1.183	1.185
65+	1.177	1.096	1.129	1.383	1.197	1.144

Comparability with Other Estimates: Caution should be exercised when comparing this data with data from other SIPP products or with data from other surveys. The comparability problems are caused by such sources as the seasonal patterns for many characteristics, different nonsampling errors, and different concepts and procedures. Refer to the *SIPP Quality Profile* for known differences with data from other sources and further discussions.

Sampling Variability: Standard errors indicate the magnitude of the sampling error. They also partially measure the effect of some nonsampling errors in response and enumeration, but do not measure any systematic biases in the data. The standard errors for the most part measure the variations that occurred by chance because a sample rather than the entire population was surveyed.

USES AND COMPUTATION OF STANDARD ERRORS

Confidence Intervals: The sample estimate and its standard error enable one to construct confidence intervals, ranges that would include the average result of all possible samples with a known probability. For example, if all possible samples were selected, each of these being surveyed under essentially the same conditions and using the same sample design, and if an estimate and its standard error were calculated from each sample, then:

1. Approximately 68 percent of the intervals from one standard error below the estimate to one standard error above the estimate would include the average result of all possible samples.

2. Approximately 90 percent of the intervals from 1.6 standard errors below the estimate to 1.6 standard errors above the estimate would include the average result of all possible samples.

3. Approximately 95 percent of the intervals from two standard errors below the estimate to two standard errors above the estimate would include the average result of all possible samples.

The average estimate derived from all possible samples is or is not contained in any particular computed interval. However, for a particular sample, one can say with a specified confidence that the average estimate derived from all possible samples is included in the confidence interval.

Hypothesis Testing: Standard errors may also be used for hypothesis testing, a procedure for distinguishing between population characteristics using sample estimates. The most common types of hypotheses tested are 1) the population characteristics are identical versus 2) they are different. Tests may be performed at various levels of significance, where a level of significance is the probability of concluding that the characteristics are different when, in fact, they are identical.

To perform the most common test, compute the difference $X_A - X_B$, where X_A and X_B are sample estimates of the characteristics of interest. A later section explains how to derive an estimate of the standard error of the difference $X_A - X_B$. Let that standard error be S_{DIFF}. If $X_A - X_B$ is between -1.6 times S_{DIFF} and +1.6 times S_{DIFF}, no conclusion about the characteristics is justified at the 10 percent significance level. If, on the other hand, $X_A - X_B$ is smaller than -1.6 times S_{DIFF} or larger than +1.6 times S_{DIFF}, the observed difference is significant at the 10 percent level. In this event, it is commonly accepted practice to say that the characteristics are different. We recommend that users report only those differences that are significant at the 10 percent level or better. Of course, sometimes this conclusion will be wrong. When the characteristics are the same, there is a 10 percent chance of concluding that they are different.

Note that as more tests are performed, more erroneous significant differences will occur. For example, at the 10 percent significance level, if 100 independent hypothesis tests are performed in which there are no real differences, it is likely that about 10 erroneous differences will occur. Therefore, the significance of any single test should be interpreted cautiously. A Bonferroni correction can be done to account for this potential problem that consists of dividing your stated level of confidence by the number of tests you are performing. This correction results in a conservative test of significance.

Note Concerning Small Estimates and Small Differences: Because of the large standard errors involved, there is little chance that estimates will reveal useful information when computed on a base smaller than 75,000. Also, nonsampling error in one or more of the small number of cases providing the estimate can cause large relative error in that particular estimate. Care must be taken in the interpretation of small differences since even a small amount of nonsampling error can cause a borderline difference to appear significant or not, thus distorting a seemingly valid hypothesis test.

Calculating Standard Errors for SIPP Estimates: There are three main ways we calculate the Standard Errors (SEs) for SIPP Estimates. They are as follows:

- Direct estimates using replicate weighting methods;
- Generalized variance function parameters (denoted as *a* and *b*); and
- Simplified tables of SEs based on the *a* and *b* parameters.

While the replicate weight methods provide the most accurate variance estimates, this approach requires more computing resources and more expertise on the part of the user. The Generalized Variance Function (GVF) parameters provide a method of balancing accuracy with resource usage as well as smoothing effect on SE estimates across time. SIPP uses the Replicate Weighting Method to produce GVF parameters (see K. Wolter, *Introduction to Variance Estimation*, Chapter 5 for more information). The GVF parameters are used to create the simplified tables of SEs.

Standard Error Parameters and Tables and Their Use: Most SIPP estimates have greater standard errors than those obtained through a simple random sample because of its two-stage cluster sample design. To derive standard errors that would be applicable to a wide variety of estimates and could be prepared at a moderate cost, a number of approximations were required as described below.

Estimates with similar standard error behavior were grouped together and two GVF parameters (denoted by ***a*** and ***b***) were developed to approximate the standard error behavior of each group of estimates. Because the actual standard error behavior was not identical for all estimates within a group, the standard errors computed from these parameters provide an indication of the order of magnitude of the standard error for any specific estimate. These ***a*** and ***b*** parameters vary by characteristic and by demographic subgroup to which the estimate applies. Tables 2a to 2h provide base ***a*** and ***b*** parameters associated with the longitudinal estimates created using the CY1, CY2, CY3, CY4, PNL1, PNL2, PNL3, and PNL4 weights on the 2004 SIPP wave-panel files.

In this section we discuss the adjustment of base ***a*** and ***b*** parameters to provide adjusted ***a*** and ***b*** parameters appropriate for each type of longitudinal and cross-sectional estimates described in the section "Use of Person Weights." Later sections will discuss the use of the adjusted parameters in various formulas to compute standard errors of estimated numbers, percent, averages, etc. Tables 2a to 2h provide the base ***a*** and ***b*** parameters needed to compute the approximate standard errors for longitudinal estimates using the CY1, CY2, CY3, CY4, PNL1, PNL2, PNL3, and PNL4 weights on the 2004 SIPP wave-panel files. Table 3 provides additional factors needed for adjusting the base ***a*** and ***b*** parameters to account for the missing data of reference months of any rotation groups in a longitudinal or cross-sectional estimate under consideration. In addition, we also provide Table 5 that gives correlations between quarterly and yearly averages of cross-sectional estimates. These correlations are used in the formula for the standard error of a difference [Formula (9)].

These factors are needed for two reasons: the monthly estimates are correlated and averaging over a greater number of monthly estimates will produce an average with a smaller standard error.

The creation of appropriate ***a*** and ***b*** parameters for the previously discussed types of estimates are described below. Again, it is assumed that all four rotation groups are used in estimation. If not, refer to the section "Adjusting Standard Errors of Estimates Which Use Less Than the Full Sample."

1. The number of people who have ever experienced a characteristic during a given time period.

   The appropriate ***a*** and ***b*** parameters are taken directly from Tables 2a to 2h. The choice of parameter depends on the weights used, on the characteristic of interest, and on the demographic subgroup of interest.

2. Amount of a characteristic accumulated by people during a given time period.

   The appropriate ***b*** parameters are also taken directly from Tables 2a to 2h.

3. The average number of consecutive months of possession of a characteristic per spell (i.e., the average spell length for a characteristic) during a given time period.

   Start with the appropriate base ***a*** and ***b*** parameters from Tables 2a to 2h. The parameters are then inflated by an additional factor, g, to account for people who experience multiple spells during the time period of interest. This factor is computed by:

$$g = \frac{\sum_{i=1}^{n} m_i^2}{\sum_{i=1}^{n} m_i}, \tag{1}$$

   where there are n people with at least one spell and m_i is the number of spells experienced by person I during the time period of interest.

4. The number of month-to-month changes in the status of a characteristic (i.e., number of transitions) summed over every set of two consecutive months during the time period of interest.

   Obtain a set of adjusted ***a*** and ***b*** parameters exactly as just described in 3, then multiply these parameters by an additional factor. Use 1.0000 if the time period of interest is two months and 2.0000 for a longer time period. (The factor of 2.0000 is based on the conservative assumption that each spell produces two transitions within the time period of interest.)

5. Monthly estimates of a characteristic averaged over a number of consecutive months.

   Appropriate base ***a*** and ***b*** parameters are taken from Tables 2a to 2h. If more than one longitudinal weight has been used in the monthly average, then there is a choice of parameters from Tables 2a to 2h. Choose the table which gives the largest parameter.

Adjusting Standard Error Parameters for Estimates which Use Less Than Full Sample: If some rotation groups are unavailable to contribute data to a given estimate, then the estimate and its standard error need to be adjusted. The adjustment of the estimate is described in a previous section. The standard error of a longitudinal estimate (Types 1 to 4) is adjusted by multiplying the appropriate ***a*** and ***b*** parameters by a factor equal to four divided by the number of rotation groups contributing data to the estimate.

For the standard error of a cross-sectional estimate which covers only one month (monthly estimates) with monthly data missing for one or more rotation groups, the factor used for adjusting the base ***a*** and ***b*** to account for the missing monthly data is provided in Table 3. For example, if the monthly data available for a monthly estimate are only from two rotation groups, then the adjusted/appropriate ***a*** and ***b*** parameters are 2 × the base ***a*** and ***b*** parameters. Similarly, Table 3 also provides the adjustment factors for the base ***a*** and ***b*** parameters for standard error calculation of quarterly estimates. For example, suppose in a quarterly estimate only six-monthly data are available instead of 12-monthly data (full sample data) and all the available six-monthly data are suitable to be used for the estimate, then the adjusted/appropriate ***a*** and ***b*** parameters are 1.8519 × the base ***a*** and ***b*** parameters.

Standard Errors of Estimated Numbers: The approximate standard error, s_x, of an estimated number of people may be obtained by using the formula:

$$s_x = \sqrt{ax^2 + bx} \qquad (2)$$

Here x is the size of the estimate and a and b are the parameters associated with the particular type of characteristic being estimated. Note that this method should not be applied to dollar values.

Illustration

Suppose the SIPP estimate of the number of people ever receiving Social Security during the first three months of 2004 is 38,122,000. [This estimate is obtained using the 2004 calendar year (CY1) weight.] The appropriate ***a*** and ***b*** parameters to use in calculating a standard error for the estimate are obtained from Table 2a. They are a = -0.00001870, b = 4,699, respectively. Using Formula (2), the approximate standard error is

$$\sqrt{(-0.00001870)(38{,}122{,}000)^2 + (4{,}699)(38{,}122{,}000)} = 389{,}819 \ \textit{persons}$$

The 90-percent confidence interval as shown by the data is from 37,480,750 to 38,763,250. Therefore, a conclusion that the average estimate derived from all possible samples lies within a range computed in this way would be correct for roughly 90 percent of all samples. Similarly, the 95-percent confidence interval as shown by the data is from 37,357,960 to 38,888,650 and we could conclude that the average estimate derived from all possible samples lies within this interval.

Standard Error of a Mean: A mean is defined here to be the average quantity of some item (other than people, families, or households) per person. For example, it could be the annual household income of females age 25 to 34. The standard error of a mean can be approximated by Formula (3) below. Because of the approximations used in developing Formula (3), an estimate of the standard error of the mean obtained from this formula will generally underestimate the true standard error. The formula used to estimate the standard error of a mean $\bar{x}$ is

$$s_{\bar{x}} = \sqrt{\left(\frac{b}{y}\right) s^2} \tag{3}$$

where y is the size of the base, s^2 is the estimated population variance of the item and b is the parameter associated with the particular type of item.

The population variance s^2 may be estimated by one of two methods. In both methods, we assume x_i is the value of the item for unit "i." (Unit may be person, family, or household). To use the first method, the range of values for the item is divided into "c" intervals. The lower and upper boundaries of interval j are Z_{j-1} and Z_j, respectively. Each unit is placed into one of "c" groups such that $Z_{j-1} < x_i < Z_j$.

The estimated population mean, $\bar{x}$, and variance, s^2, are given by the formulas:

$$\begin{aligned} \bar{x} &= \sum_{j=1}^{c} p_j m_j \\ s^2 &= \sum_{j=1}^{c} p_j m_j^2 - \bar{x}^2, \end{aligned} \tag{4}$$

where p_j is the estimated proportion of units in group j, and $m_j = (Z_{j-1} + Z_j)/2$. The most representative value of the item in group j is assumed to be m_j. If group "c" is open-ended, or there exists no upper interval boundary, then an approximate value for m_c is

$$m_c = \frac{3}{2} Z_{c-1} .$$

In the second method, the estimated population mean, $\bar{x}$, and variance, s^2, are given by the formulas

$$\bar{x} = \frac{\sum_{i=1}^{n} w_i x_i}{\sum_{i=1}^{n} w_i}$$

$$s^2 = \frac{\sum_{i=1}^{n} w_i x_i^2}{\sum_{i=1}^{n} w_i} - \bar{x}^2, \qquad (5)$$

where there are n units with the item of interest and w_i is the final weight for unit "I" (note that $\sum w_i = y$).

Illustration of Method 1

Suppose that the 2004 distribution of annual incomes is given in Table 4 for people aged 25 to 34 who were employed for all 12 months of 2004.

$$\bar{x} = \frac{370}{23{,}527}(2{,}500) + \frac{302}{23{,}527}(6{,}250) + \ldots + \frac{2{,}138}{23{,}527}(105{,}000) = \$38{,}704.$$

Using Formula (4) and the mean annual cash income of \$38,704 the estimated population variance, s^2, is

$$s^2 = \frac{370}{23{,}527}(2{,}500)^2 + \frac{302}{23{,}527}(6{,}250)^2 + \ldots + \frac{2{,}138}{23{,}527}(105{,}000)^2 - (38{,}704)^2 = 649{,}457{,}303.$$

The appropriate ***b*** parameter from Table 2a is 4,699. Now, using Formula (3), the estimated standard error of the mean is

$$s_{\bar{x}} = \sqrt{\frac{4{,}699}{23{,}527{,}377}(649{,}457{,}303)} = \$360$$

Illustration of Method 2

Suppose that we are interested in estimating the average length of spells of food stamp recipiency during the calendar year 2004 for a given subpopulation. Also, suppose there are only 10 sample people in the subpopulation who were food stamp recipients. (This example is a hypothetical situation used for illustrative purposes only; actually, 10 sample cases would be too few for a reliable estimate and their weights could be substantially different from those given.) The number of consecutive months of food stamp recipiency during 2004 and the CY1 weights are given in the table below for each sample person:

Sample Person	Spell Length in Months	CY1 Weight
1	4, 3	5,300
2	5	7,100
3	9	4,900
4	3,3,2	6,500
5	12	9,200
6	12	5,900
7	4,1	7,600
8	7	4,200
9	6	5,500
10	4	5,700

Using the following formula , the average spell of food stamp recipiency is estimated to be

The standard error will be computed by Formula (3). First, the estimated population variance can be obtained by Formula (5):

$$s^2 = \frac{(5300)(4)^2 + (5300)(3)^2 + \ldots + (5700)(4)^2}{5300 + 5300 + \ldots + 5700} - (5.4)^2$$

$$= 12.4 \ (months)^2$$

Next, the base ***b*** parameter of 4,596 is taken from Table 2a and multiplied by the factor computed from Formula (1):

$$g = \frac{2^2 + 1 + 1 + 3^2 + 1 + 1 + 2^2 + 1 + 1 + 1}{2 + 1 + 1 + 3 + 1 + 1 + 2 + 1 + 1 + 1}$$

$$= 1.71$$

Therefore, the final ***b*** parameter is 1.71 × 4,596 = 7,859, and the standard error of the mean from Formula (3) is:

$$s = \sqrt{\frac{7{,}859}{87{,}800}\ (12.4)} = 1.05\ \textit{months}$$

Standard error of an Aggregate: An aggregate is defined to be the total quantity of an item summed over all the units in a group. The standard error of an aggregate can be approximated using Formula (6).

As with the estimate of the standard error of a mean, the estimate of the standard error of an aggregate will generally underestimate the true standard error. Let y be the size of the base, s^2 be the estimated population variance of the item obtained using Formula (4) or Formula (5) and ***b*** be the parameter associated with the particular type of item. The standard error of an aggregate is:

$$s_x = \sqrt{(b)\ (y) s^2} \qquad (6)$$

Standard Errors of Estimated Percentages: The reliability of an estimated percentage, computed using sample data for both numerator and denominator, depends upon both the size of the percentage and the size of the total upon which the percentage is based. Estimated percentages are relatively more reliable than the corresponding estimates of the numerators of the percentages, particularly if the percentages are 50 percent or more, e.g., the percent of people employed is more reliable than the estimated number of people employed. When the numerator and denominator of the percentage have different parameters, use the parameter (and appropriate factor) of the numerator. If proportions are presented instead of percentages, note that the standard error of a proportion is equal to the standard error of the corresponding percentage divided by 100.

There are two types of percentages commonly estimated. The first is the percentage of people sharing a particular characteristic such as the percent of people owning their own home. The second type is the percentage of money or some similar concept held by a particular group of people or held in a particular form. Examples are the percent of total wealth held by people with high income and the percent of total income received by people on welfare.

For the percentage of people, the approximate standard error, $s_{(x,p)}$, of the estimated percentage p may be approximated by the formula

$$s_{(x,p)} = \sqrt{\frac{b}{x}(p)(100-p)}. \tag{7}$$

Here x is the size of the subclass of social units which is the base of the percentage, p is the percentage $(0 < p < 100)$, and b is the parameter associated with the characteristic in the numerator.

Illustration

Suppose that using the 4-Wave weight, it was estimated that 59,355,000 males were employed in July 2004 and an estimated 2.4 percent of them became unemployed in August 2004. The base "b" parameter is 4,820 (from Table 2e). Using Formula (7) and the appropriate "b" parameter, the approximate standard error is

$$\sqrt{\frac{(4{,}820)}{(59{,}355{,}000)}(2.4)(100-2.4)} = 0.14 \textit{ percent.}$$

Consequently, the 90-percent confidence interval as shown by these data is from 2.18 to 2.62 percent.

For percentages of money, a more complicated formula is required. A percentage of money will usually be estimated in one of two ways. It may be the ratio of two aggregates:

$$p_I = 100\ (x_A \ / \ x_N)$$

or it may be the ratio of two means with an adjustment for different bases:

$$p_I = 100\ (\hat{p}_A\ \bar{x}_A\ /\ \bar{x}_N)$$

where x_A and x_N are aggregate money figures, $\bar{x}_A$ and $\bar{x}_N$ are mean money figures, and $\hat{p}_A$ is the estimated number in group A divided by the estimated number in group N.

In either case, we estimate the standard error as

$$s_I = \sqrt{\left(\frac{\hat{p}_A \bar{x}_A}{\bar{x}_N}\right)^2 \left[\left(\frac{s_p}{\hat{p}_A}\right)^2 + \left(\frac{s_A}{\bar{x}_A}\right)^2 + \left(\frac{s_B}{\bar{x}_N}\right)^2\right]}\ , \qquad (8)$$

where s_p is the standard error of $\hat{p}_A$, s_A is the standard error of $\bar{x}_A$ and s_B is the standard error of $\bar{x}_N$. To calculate s_p, use Formula (7). The standard errors of $\bar{x}_N$ and $\bar{x}_A$ may be calculated using Formula (3).

It should be noted that there is frequently some correlation between $\hat{p}_A$, $\bar{x}_N$ and $\bar{x}_A$. Depending on the magnitude and sign of the correlations, the standard error will be over or underestimated.

<u>Illustration</u>

Suppose that in October 2004 an estimated 8.8% of males 16 years and over were black, the mean monthly earnings of these black males was \$1288, the mean monthly earnings of all males 16 years and over was \$1911, and the corresponding standard errors are 0.28%, \$36, and \$27. Then, the percent of male earnings made by blacks in October 2004 is:

$$p_M = .088 \left(\frac{1288}{1911}\right) x\ 100$$

$$= 5.9\%$$

Using Formula (8), the approximate standard error is:

$$s_M = \sqrt{\left(\frac{(.088)(1288)}{1911}\right)^2 \left[\left(\frac{.0028}{.0880}\right)^2 + \left(\frac{36}{1288}\right)^2 + \left(\frac{27}{1911}\right)^2\right]}$$

$$= 0.26\%$$

Standard Error of a Difference: The standard error of a difference between two sample estimates is approximately equal to

$$s_{(x-y)} = \sqrt{s_x^{\,2} + s_y^{\,2} - r\, s_x\, s_y}\ , \tag{9}$$

where s_x and s_y are the standard errors of the estimates x and y.

The estimates can be numbers, percent, ratios, etc. The correlation between x and y is represented by r. Some correlations are given in Table 5. The above formula assumes that the correlation coefficient between the characteristics estimated by x and y is non-zero. If no correlations have been provided for a given set of x and y estimates, assume $r = 0$. However, if the correlation is really positive (negative), then this assumption will tend to cause overestimates (underestimates) of the true standard error.

<u>Illustration</u>

Suppose that SIPP estimates show the number of people age 35-44 years with annual cash income of $50,000 to $59,999 was 3,186,000 in 2004 and the number of people age 25-34 years with annual cash income of $50,000 to $59,999 in the same time period was 2,619,000. Then, using parameters from Table 2a and Formula (2), the standard errors of these numbers are approximately 121,577 and 110,356, respectively. The difference in sample estimates is 567,000 and using Formula (9), the approximate standard error of the difference is

$$\sqrt{(121{,}577)^2 + (110{,}356)^2} = 164{,}190\ .$$

Suppose that it is desired to test at the 10 percent significance level whether the number of people with annual cash income of $50,000 to $59,999 was different for people age 35-44 years than for people age 25-34 years. To perform the test, compare the difference of 567,000 to the product $1.645 * 164{,}190 = 270{,}090$. Since the difference is larger than 1.645 times the standard error of the difference, the data show that the two age groups are significantly different at the 10 percent significance level.

Standard Error of a Median: The median quantity of some item such as income for a given group of people is that quantity such that at least half the group have as much or more and at least half the group have as much or less. The sampling variability of an estimated median depends upon the form of the distribution of the item as well as the size of the group. To calculate standard errors on medians, the procedure described below may be used.

The median, like the mean, can be estimated using either data which have been grouped into intervals or ungrouped data. If grouped data are used, the median is estimated using Formulas (10) or (11) with p = 0.5. If ungrouped data are used, the data records are ordered based on the value of the characteristic, then the estimated median is the value of the characteristic such that the weighted estimate of 50 percent of the subpopulation falls at or below that value and 50 percent is at or above that value. Note that the method of standard error computation which is presented here requires the use of grouped data. Therefore, it should be easier to compute the median by grouping the data and using Formulas (10) or (11).

An approximate method for measuring the reliability of an estimated median is to determine a confidence interval about it. (See the section on sampling variability for a general discussion of confidence intervals.) The following procedure may be used to estimate the 68-percent confidence limits and hence the standard error of a median based on sample data.

- Determine, using Formula (7), the standard error of an estimate of 50 percent of the group.

- Add to and subtract from 50 percent the standard error determined in step 1.

- Using the distribution of the item within the group, calculate the quantity of the item such that the percent of the group with more of the item is equal to the smaller percentage found in step 2. This quantity will be the upper limit for the 68-percent confidence interval. In a similar fashion, calculate the quantity of the item such that the percent of the group with more of the item is equal to the larger percentage found in step 2. This quantity will be the lower limit for the 68-percent confidence interval.

- Divide the difference between the two quantities determined in step 3 by two to obtain the standard error of the median.

To perform step 3, it will be necessary to interpolate. Different methods of interpolation may be used. The most common are simple linear interpolation and Pareto interpolation. The appropriateness of the method depends on the form of the distribution around the median. If density is declining in the area, then we recommend Pareto interpolation. If density is fairly constant in the area, then we recommend linear interpolation. Note, however, that Pareto interpolation can never be used if the interval contains zero or negative measures of the item of interest. Interpolation is used as follows. The quantity of the item such that p percent have more of the item is

$$X_{pN} = exp\left[\left(Ln\left(\frac{pN}{N_1}\right) \Big/ Ln\left(\frac{N_2}{N_1}\right)\right) \; Ln\left(\frac{A_2}{A_1}\right)\right] A_1 \; . \qquad (10)$$

if Pareto Interpolation is indicated and

$$X_{pN} = \left[\frac{pN - N_1}{N_2 - N_1} \ (A_2 - A_1) \ + \ A_1 \right] \tag{11}$$

if linear interpolation is indicated, where

N	is the size of the group,
A_1 and A_2	are the lower and upper bounds of the interval in which X_{pN} falls,
N_1 and N_2	are the estimated number of group members owning more than A_1 and A_2,
exp	refers to the exponential function and
Ln	refers to the natural logarithm function

Illustration

To illustrate the calculations for the sampling error on a median, we return to Table 4. The median annual income for this group is \$32,200. The size of the group is 23,527,000.

1. Using Formula (7), the standard error of 50 percent on a base of 23,527,000 is about 0.71 percentage points.

2. Following step 2, the two percentages of interest are 49.29 and 50.71.

3. By examining Table 4, we see that the percentage 49.29 falls in the income interval from 30,000 to 39,999. (Since 54.7% receive more than \$30,000 per month, the dollar value corresponding to 49.29 must be between \$30,000 and \$39,999). Thus, $A_1 = \$30{,}000$, $A_2 = \$39{,}999$, $N_1 = 18{,}377{,}000$, and $N_2 = 12{,}881{,}000$.

In this case, we decided to use Pareto interpolation. Therefore, the upper bound of a 68% confidence interval for the median is

$$\$30{,}000 \ \exp\left[\left(Ln\left(\frac{(.4929)(23{,}527{,}000)}{18{,}377{,}000} \right) \Big/ Ln\left(\frac{12{,}881{,}000}{18{,}377{,}000} \right) \right) Ln\left(\frac{39{,}999}{30{,}000} \right) \right] = \$43{,}549 \ .$$

Also by examining Table 4, we see that 50.71 falls in the same income interval. Thus, A_1, A_2, N_1, and N_2 are the same. We also use Pareto interpolation for this case. So the lower bound of a 68% confidence interval for the median is

$$\$30{,}000 \ \exp\left[\left(Ln\left(\frac{(.5071)(23{,}527{,}000)}{18{,}377{,}000}\right) \Big/ Ln\left(\frac{12{,}881{,}000}{18{,}377{,}000}\right)\right) Ln\left(\frac{39{,}999}{30{,}000}\right)\right] = \$42{,}560 \ .$$

Thus, the 68-percent confidence interval on the estimated median is from \$42,560 to \$43,549. An approximate standard error is

$$\frac{\$43{,}549 - \$42{,}560}{2} = \$494.50 \ .$$

Standard Errors of Ratios of Means and Medians: The standard error for a ratio of means or medians is approximated by:

$$s_{\left(\frac{x}{y}\right)} = \sqrt{\left(\frac{x}{y}\right)^2 \left[\left(\frac{s_y}{y}\right)^2 + \left(\frac{s_x}{x}\right)^2\right]} \qquad (12)$$

where x and y are the means or medians, and s_x and s_y are their associated standard errors. Formula (12) assumes that the means are not correlated. If the correlation between the population means estimated by x and y are actually positive (negative), then this procedure will tend to produce overestimates (underestimates) of the true standard error for the ratio of means.

Standard Errors Using SAS or SPSS: Standard errors and their associated variance, calculated by SAS or SPSS statistical software package, do not accurately reflect the SIPP's complex sample design. Erroneous conclusions will result if these standard errors are used directly. We provide adjustment factors by characteristics that should be used to correctly compensate for likely under-estimates. The factors called DEFF available in Table 2, must be applied to SAS or SPSS generated variances. The square root of DEFF can be directly applied to similarly generated standard errors. These factors approximate design effects which adjust statistical measures for sample designs more complex than simple random sample.

Table 1 - SIPP Panel 2004 Reference Months (Horizontal) for Each Interview Month (Vertical)

Month of Interview	Wave / Rotation	2003			2004												2005												2006												2007											
		4th Quarter			1St Quarter			2nd Quarter			3rd Quarter			4Th Quarter			1St Quarter			2nd Quarter			3rd Quarter			4Th Quarter			1St Quarter			2nd Quarter			3rd Quarter			4Th Quarter			1St Quarter			2nd Quarter			3rd Quarter			4Th Quarter		
		Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Spt	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Spt	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Spt	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Spt	Oct	Nov	Dec
Feb 04	1/1	1	2	3	4																																															
Mar	1/2		1	2	3	4																																														
Apr	1/3			1	2	3	4																																													
May	1/4				1	2	3	4																																												
Jun	2/1					1	2	3	4																																											
July	2/2						1	2	3	4																																										
Aug	2/3							1	2	3	4																																									
Sept	2/4								1	2	3	4																																								
Oct	3/1									1	2	3	4																																							
Nov	3/2										1	2	3	4																																						
Dec	3/3											1	2	3	4																																					
Jan 05	3/4												1	2	3	4																																				
Feb	4/1													1	2	3	4																																			
Mar	4/2														1	2	3	4																																		
Apr	4/3															1	2	3	4																																	
May	4/4																1	2	3	4																																
Jun	5/1																	1	2	3	4																															
July	5/2																		1	2	3	4																														
Aug	5/3																			1	2	3	4																													
Sept	5/4																				1	2	3	4																												
Oct	6/1																					1	2	3	4																											
Nov	6/2																						1	2	3	4																										
Dec	6/3																							1	2	3	4																									
Jan 06	6/4																								1	2	3	4																								
Feb	7/1																									1	2	3	4																							
Mar	7/2																										1	2	3	4																						
Apr	7/3																											1	2	3	4																					
May	7/4																												1	2	3	4																				
Jun	8/1																													1	2	3	4																			
July	8/2																														1	2	3	4																		
Aug	8/3																															1	2	3	4																	
Sep	8/4																																1	2	3	4																
Oct	9/1																																	1	2	3	4															
Nov	9/2																																		1	2	3	4														
Dec	9/3																																			1	2	3	4													
Jan 07	9/4																																				1	2	3	4												
Feb	10/1																																					1	2	3	4											
Mar	10/2																																						1	2	3	4										
Apr	10/3																																							1	2	3	4									
May	10/4																																								1	2	3	4								
Jun	11/1																																									1	2	3	4							
Jul	11/2																																										1	2	3	4						
Aug	11/3																																											1	2	3	4					
Sep	11/4																																												1	2	3	4				
Oct	12/1																																													1	2	3	4			
Nov	12/2																																														1	2	3	4		
Dec	12/3																																															1	2	3	4	
Jan 08	12/4																																																1	2	3	4

Table 2a - SIPP Generalized Variance Function Parameters for Calendar Year Estimates (Associated with the Survey Universe in January 2004) in Time Periods Covered by the Calendar Year 2004 Using the 2004 Calendar Year Weight (the CY1 Weight)

Characteristics	**Parameters**		
Individuals	***a***	***b***	**DEFF**
Poverty and Program Participation	-0.00001844	4596	2.31
Male	-0.00003407	4596	
Female	-0.00003227	4596	
Income and Labor Force	-0.00001870	4699	2.36
Male	-0.00003416	4699	
Female	-0.00003241	4699	
Other (Person) Items	-0.00001411	4673	2.35
Male	-0.00002421	4673	
Female	-0.00002352	4673	
Black (Person) Items	-0.00010088	4511	2.27
Male	-0.00015616	4511	
Female	-0.00014841	4511	
Hispanic (Person) Items	-0.00012472	6343	3.19
Male	-0.00018126	6343	
Female	-0.00018359	6343	
Households			
Total or White	-0.00003182	3962	1.99
Black	-0.00020639	3962	
Hispanic	-0.00031669	3962	

Note: The effective sampling intervals used for the design effect (DEFF) calculation before and after the sample reduction at Wave 9 are 1990 and 4280, respectively.

Table 2b - SIPP Generalized Variance Function Parameters for Calendar Year Estimates (Associated with the Survey Universe in January 2005) in Time Periods Covered by the Calendar Year 2005 Using the 2005 Calendar Year Weight (the CY2 Weight)

Characteristics		Parameters		
Individuals		***a***	***b***	**DEFF**
Poverty and Program Participation		-0.000021378	5398	2.71
	Male	-0.000039419	5398	
	Female	-0.000037407	5398	
Income and Labor Force		-0.000021601	5449	2.74
	Male	-0.000039884	5449	
	Female	-0.000037842	5449	
Other (Person) Items		-0.000016608	5494	2.76
	Male	-0.000028953	5494	
	Female	-0.000028112	5494	
Black (Person) Items		-0.000115866	5304	2.67
	Male	-0.000174875	5304	
	Female	-0.000167630	5304	
Hispanic (Person) Items		-0.000145460	7696	3.87
	Male	-0.000209876	7697	
	Female	-0.000212475	7696	
Households				
Total or White		-0.000037568	4667	2.35
Black		-0.000235329	4667	
Hispanic		-0.000385900	4667	

Note: The effective sampling intervals used for the design effect (DEFF) calculation before and after the sample reduction at Wave 9 are 1990 and 4280, respectively.

Table 2c - SIPP Generalized Function Variance Parameters for Calendar Year Estimates (Associated with the Survey Universe in January 2006) in Time Periods Covered by the Calendar Year 2006 Using the 2006 Calendar Year Weight (the CY3 Weight)

Characteristics	**Parameters**		
Individuals	***a***	***b***	**DEFF**
Poverty and Program Participation	-0.000045350	11474	2.68
Male	-0.000084658	11474	
Female	-0.000080342	11474	
Income and Labor Force	-0.000043419	11155	2.61
Male	-0.000079442	11155	
Female	-0.000075596	11155	
Other (Person) Items	-0.000032759	11552	2.70
Male	-0.000063031	11552	
Female	-0.000061119	11552	
Black (Person) Items	-0.00026114	11859	2.77
Male	-0.000409398	11859	
Female	-0.000387947	11859	
Hispanic (Person) Items	-0.000279138	14495	3.39
Male	-0.000434854	14495	
Female	-0.000445393	14495	
Households			
Total or White	-0.000075478	9649	2.25
Black	-0.000510360	9649	
Hispanic	-0.000623738	9649	

Note: The effective sampling intervals used for the design effect (DEFF) calculation before and after the sample reduction at Wave 9 are 1990 and 4280, respectively.

Table 2d - SIPP Generalized Function Variance Parameters for Calendar Year Estimates (Associated with the Survey Universe in January 2007) in Time Periods Covered by the Calendar Year 2007 Using the 2007 Calendar Year Weight (the CY4 Weight)

Characteristics	**Parameters**		
Individuals	***a***	**b**	**DEFF**
Poverty and Program Participation	-0.000046499	12005	2.80
Male	-0.000085921	12005	
Female	-0.000081741	12005	
Income and Labor Force	-0.000042586	11184	2.61
Male	-0.000076913	11184	
Female	-0.000073395	11184	
Other (Person) Items	-0.000035703	11996	2.80
Male	-0.000062547	11996	
Female	-0.000060802	11996	
Black (Person) Items	-0.000270121	12328	2.88
Male	-0.000429407	12328	
Female	-0.000405296	12328	
Hispanic (Person) Items	-0.000274027	15130	3.53
Male	-0.000412444	15130	
Female	-0.000420695	15130	
Households			
Total or White	-0.000075479	9837	2.30
Black	-0.000527198	9837	
Hispanic	-0.000642352	9837	

Note: The effective sampling intervals used for the design effect (DEFF) calculation before and after the sample reduction at Wave 9 are 1990 and 4280, respectively.

Table 2e - SIPP Generalized Function Variance Parameters for Panel Estimates (Associated with the Survey Universe in January 2004) in Time Periods Covered by Wave 1 through Wave 4 Using the First Four Wave Panel Weight (the PNL1 Weight)

Characteristics	**Parameters**		
Individuals	***a***	***b***	**DEFF**
Poverty and Program Participation	-0.000018809	4688	2.36
Male	-0.000034746	4688	
Female	-0.000032911	4688	
Income and Labor Force	-0.000019235	4820	2.42
Male	-0.000035274	4820	
Female	-0.000033446	4820	
Other (Person) Items	-0.00001442	4767	2.40
Male	-0.00002482	4767	
Female	-0.00002410	4767	
Black (Person) Items	-0.00010298	4630	2.33
Male	-0.00015777	4630	
Female	-0.00015045	4630	
Hispanic (Person) Items	-0.00012900	6545	3.29
Male	-0.00018816	6545	
Female	-0.00019069	6545	
Households			
Total or White	-0.00003231	4029	2.02
Black	-0.00021094	4029	
Hispanic	-0.00032671	4029	

Note: The effective sampling intervals used for the design effect (DEFF) calculation before and after the sample reduction at Wave 9 are 1990 and 4280, respectively.

Table 2f - SIPP Generalized Function Variance Parameters for Panel Estimates (Associated with the Survey Universe in January 2004) in Time Periods Covered by Wave 1 through Wave 7 Using the First Seven Wave Panel Weight (the PNL2 Weight)

Characteristics	**Parameters**		
Individuals	***a***	***b***	**DEFF**
Poverty and Program Participation	-0.000023261	5741	2.88
Male	-0.000035443	5741	
Female	-0.000034100	5741	
Income and Labor Force	-0.000023704	5897	2.96
Male	-0.000043893	5897	
Female	-0.000041560	5897	
Other (Person) Items	-0.00001774	5797	2.91
Male	-0.00003104	5797	
Female	-0.00003009	5797	
Black (Person) Items	-0.00012560	5669	2.84
Male	-0.00019080	5669	
Female	-0.00018244	5669	
Hispanic (Person) Items	-0.00015613	7951	4.00
Male	-0.00022641	7951	
Female	-0.00022926	7951	
Households			
Total or White	-0.00003878	4843	2.43
Black	-0.00024596	4843	
Hispanic	-0.00039736	4843	

Note: The effective sampling intervals used for the design effect (DEFF) calculation before and after the sample reduction at Wave 9 are 1990 and 4280, respectively.

Table 2g - SIPP Generalized Function Variance Parameters for Panel Estimates (Associated with the Survey Universe in January 2004) in Time Periods Covered by Wave 1 through Wave 10 Using the First Ten Wave Panel Weight (the PNL3 Weight)

Characteristics	**Parameters**		
Individuals	***a***	***b***	**DEFF**
Poverty and Program Participation	-0.000052733	12873	3.01
Male	-0.000100006	12873	
Female	-0.000094407	12873	
Income and Labor Force	-0.000051547	12949	3.02
Male	-0.000094212	12949	
Female	-0.000089373	12949	
Other (Person) Items	-0.000040099	13000	3.04
Male	-0.000094212	13000	
Female	-0.000089373	13000	
Black (Person) Items	-0.000314223	13967	3.26
Male	-0.000492206	13967	
Female	-0.000466023	13967	
Hispanic (Person) Items	-0.000306143	14957	3.49
Male	-0.000473400	14957	
Female	-0.000483577	14957	
Households			
Total or White	-0.000083253	10599	2.48
Black	-0.000612294	10599	
Hispanic	-0.000718430	10599	

Note: The effective sampling intervals used for the design effect (DEFF) calculation before and after the sample reduction at Wave 9 are 1990 and 4280, respectively.

Table 2h - SIPP Generalized Function Variance Parameters for Panel Estimates (Associated with the Survey Universe in January 2004) in Time Periods Covered by Wave 1 through Wave 12 Using the Full Twelve Wave Panel Weight (the PNL4 Weight)

Characteristics	**Parameters**		
Individuals	***a***	***b***	**DEFF**
Poverty and Program Participation	-0.000058709	14285	3.34
Male	-0.000111855	14285	
Female	-0.000105480	14285	
Income and Labor Force	-0.000057559	14392	3.36
Male	-0.000105866	14392	
Female	-0.000100336	14392	
Other (Person) Items	-0.000044526	14389	3.36
Male	-0.000079109	14389	
Female	-0.000076588	14389	
Black (Person) Items	-0.000372795	16453	3.84
Male	-0.000592109	16453	
Female	-0.000558159	16453	
Hispanic (Person) Items	-0.000329907	16205	3.78
Male	-0.000506100	16205	
Female	-0.000516436	16205	
Households			
Total or White	-0.000097603	11569	2.70
Black	-0.000665673	11569	
Hispanic	-0.000801331	11569	

Note: The effective sampling intervals used for the design effect (DEFF) calculation before and after the sample reduction at Wave 9 are 1990 and 4280, respectively.

Table 3 - Adjustment Factors to Be Applied to the *a* and *b* Base Parameters to Obtain Appropriate *a* and *b* Parameters for Monthly and Quarterly Estimates with Monthly Data Unavailable or Available but Not Usable from One or More Rotation Groups.

Number of available rotation group months available and actually useable for	Adjustment Factor
Monthly estimate	
1	4.0000
2	2.0000
3	1.3333
4	1.0000
Quarterly estimate	
6	1.8519
8	1.4074
9	1.2222
10	1.0494
11	1.0370

Table 4 - Hypothetical Distribution of Annual Income Among People 25 to 34 Years Old

Intervals of Annual Cash Income	Total	under $5000	$5000 to $7499	$7500 to $9999	$10000 to $12,499	$12,500 to $14,999	$15,000 to $17,499	$17,500 to $19,999	$20,000 to $29,999	$30,000 to $39,999	$40,000 to $49,999	$50,000 to $59,999	$60,000 to $69,999	$70,000 and over
Mid-intervals of Annual Cash Income		2,500	6250	8750	11,250	13,750	16,250	18,750	25,000	35,000	45,000	55,000	65,000	105,000
Thousands in interval	23,527	370	302	447	685	935	1,113	1,298	5,496	4,596	3,121	1,902	1,124	2,138
Cumulative with at least as much as lower bound of interval		23,527	23,158	22,856	22,409	21,724	20,789	19,675	18,377	12,881	8,285	5,164	3,262	2,138
Percent with at least as much as lower bound of interval		100.0	98.4	97.1	95.2	92.3	88.4	83.6	78.1	54.7	35.2	21.9	13.9	9.1

Table 5 - Correlations between Estimates of the Same Characteristic at Two Points of Time. Both Estimates must be Monthly Estimates Averaged over Quarters or Years

	Quarterly Estimates				
	Consecutive Quarters	1 Quarter Apart	2 Quarters Apart	3 Quarters Apart	Calendar Year Estimates 2001 to 2002
INDIVIDUALS					
A. Both Estimates Created Using The Same Weight, Either 4 Wave, 7 Wave, or 9 Wave Weights					
Income					
Social Security or Private Pensions	0.97	0.86	0.75		
Other	0.72	0.63	0.54		
B. One Estimate Created Using An Annual Weight While The Other Estimate Is Created Using A Different Annual Weight					
Income					
Social Security or Private Pensions	0.81	0.72	0.63	0.55	0.70
Other	0.60	0.53	0.45	0.37	0.49
C. Both Estimates Created Using The 9 Wave (or Panel) Weight					
Income					
Social Security or Private Pensions	0.97	0.86	0.75	0.65	0.83
Other	0.72	0.63	0.54	0.46	0.58